

# **Capturing the speed of music in our heads: Developing methods for measuring the tempo of musical imagery**

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In: Jakubowski, K., Farrugia, N., Floridou, G.A., & Gagen, J. (Eds.)  
Proceedings of the 7th International Conference of Students of Systematic Musicology (SysMus14)  
London, UK, 18-20 September 2014, <http://www.musicmindbrain.com/#!/sysmus-2014/cfmp>

The experience of imagining music is a common phenomenon. Musicians use mental rehearsal to help them memorize and prepare for performances, and even non-musicians regularly experience “earworms”, i.e., having a tune stuck in one’s head on repeat. Voluntarily imagined music is highly accurate in terms of pitch, rhythm, and timbre and recruits brain regions that are remarkably similar to those recruited in perceiving music.

In terms of tempo, it has been found that even non-musicians can sing familiar pop songs very close to the original recorded tempo. This implies that the tempo of imagery is quite accurate, as participants must generate an image of a song before singing it aloud. However, this has not been previously tested in such a way that the imagery remains purely imagined, without becoming a sound production task. As such, the first aim of the present study is to test the accuracy of tempo judgments for purely imagined songs. The second aim is to explore the influence of individual differences on these tempo judgments, including previous musical training, musical engagement, general auditory imagery abilities, and familiarity with the stimuli.

We utilized three methods of measuring each participant’s memory for the tempo of 12 familiar pop songs: 1) tapping to the beat of each song whilst imagining the song (hereafter Imagery (motor) task), 2) adjusting the speed of a click track to the beat of each song, again whilst imagining (hereafter Imagery (non-motor) task), and 3) adjusting the speed of each song whilst hearing the actual songs aloud (hereafter Perceived Music task). It was hypothesized that participants would perform most accurately in the Perceived Music condition—where all musical cues were present, but that motor engagement with musical imagery (in the Imagery (motor) task) would also improve performance, in line with previous literature.

Significant differences were found in performance between all three tasks, such that performance on the Perceived Music task was significantly more accurate than in the Imagery tasks, and performance in the Imagery (motor) task was significantly more accurate than in the Imagery (non-motor) task. Performance in the Imagery tasks was also influenced by individual differences in musical training and/or engagement, whilst performance on the Perceived Music task was only influenced by previous familiarity with the musical stimuli.

The results of the study help to inform us as to precisely how accurately tempo is preserved within musical imagery, and how this is modulated by other factors such as musical training and familiarity. The findings also have implications within the domain of mental music rehearsal.

**Keywords:** musical imagery, tempo, musical memory